

# Effect of Derivatives Trading on the Volatility in the Indian Stock Market

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## ABSTRACT

*The effect of derivatives trading on the volatility of underlying spot market has always remained a topic of empirical interest. Yet the literature is still inconclusive on the issue that whether the introduction of derivatives trading increases or decreases the volatility in the underlying cash market. Theoretically, a number of arguments have been given supporting both of these views. On the one side it is argued that the introduction of derivatives trading brings in new investors, improves liquidity in the market, increases information flows, provides more investment choices, leads to better price discovery and thereby reduces volatility. On the other hand it is also the viewpoint of many financial experts that allowing derivatives trading invites huge participation from speculative investors, leads to excessive leveraged positions and thereby increases volatility in the underlying spot market. The present paper compares the volatility in the periods of pre and post introduction of index derivative contracts by computing the rolling standard deviations and the variances in the daily return data of S&P CNX Nifty Index over different period event windows.*

**Keywords:** Effect of derivatives trading, nifty futures, Volatility

## INTRODUCTION

One of the most studied topics in the modern finance is the impact of introduction of derivatives trading on the pricing of underlying assets. Primarily these studies are focused on the issue whether the derivatives trading increases or decreases volatility in the underlying asset's price. Worldwide the studies are inconclusive about the effect of derivatives trading on the spot market volatility. In India, the National Stock Exchange of India limited commenced derivatives trading with the introduction of futures trading on the most popular benchmark, that is, S&P CNX Nifty Index on June 12, 2000. Secondly, the exchange introduced options contracts on the underlying Nifty on June 4, 2001. Thirdly, NSE started trading in options on individual stocks from July, 2001. Finally, the futures trading on individual stocks commenced on November 9, 2001. Since then the trading in derivative segment has witnessed a phenomenal growth. The average daily turnover in the equity derivative segment of NSE has increased from a meager figure of Rs. 11 Cr. in the year 2000-2001 to Rs. 1752 Cr. in year 2002-2003 and Rs. 115150.48 Cr. in year 2010-2011.

Presently besides S&P CNX Nifty, the National Stock Exchange allows derivatives trading in 223 securities and some other popular indices like CNX-IT, Bank Nifty and Nifty Midcap 50. Further the exchange also allows trading in Mini Nifty futures and options contracts and the long term option contracts on S&P CNX Nifty.

Theoretically, it is argued that due to the inherent advantage of low transaction costs and leverage feature the derivative trading causes some speculative trading shift from the cash segment to the derivative segment. Such migration of speculative investors from the spot market to the derivative market will cause a decreased volatility in the spot market. Moreover the introduction of derivative contracts increase investment choices, enhances information flows, leads to better price discovery and provides excellent hedging opportunities. On the other hand it is also argued by many experts that the derivative market encourage excessive participation from the speculative investors. Such leverage based excessive speculative activity lowers the quality of information and thus destabilises the underlying cash markets.

### **LITERATURE REVIEW**

Numerous studies are conducted worldwide to evaluate the effect of introduction of derivative trading on the spot market volatility. Some of these studies argued that the introduction of derivatives reduces volatility in the underlying spot markets. Pilar and Rafel (2002) examined the effect of introduction of futures and options in the Spanish market from October 1990 to December 1994 and observed a decrease in the uncertainty in the underlying market and an increase in the liquidity in the post derivatives period. Drimbetas et al. (2007) analysed the data from August 1997 to April 2005 to find the effects of the introduction of the futures and options into the FTSE/ASE 20 index on the volatility of the underlying index. Their study found that the introduction of derivatives has induced a reduction of the conditional volatility of the FTSE/ASE20 index and consequently it has increased its efficiency. Mckenzie et al. (2000) evaluated the impact of trading in future contracts on individual stocks on the systematic risk and volatility of the underlying shares in the Australian equity market. Their study observed a general reduction in systematic risk on individual stocks following the listing of futures. They also evidenced a decline in the unconditional volatility. However the findings of the study were mixed concerning the impact of future contracts on conditional volatility. Bollen (1998) compared the changes in the return variance of optioned stocks to changes in the return variance of a control group in the US market and observed that average change in the control group is statistically indistinguishable from the average change in the optioned stocks, thus option introductions do not significantly affect stock return variance. Rahman (2001) also examined the the impact of trading in the Dow Jones Industrial Average (DJIA) index futures and futures options on the conditional volatility of component stocks. The results suggest that the introduction of index futures and futures options on the DJIA has produced no structural changes in the conditional volatility of component stocks. Pok and Poshakwale (2004) analysed the impact of the introduction of futures trading on spot market volatility using data from both the underlying and non-underlying stocks in the emerging Malaysian stock market. Their results showed that the onset of futures trading increases spot market volatility and the flow of information to the spot market. They also found that the underlying stocks respond more quickly to the recent news than the non-underlying stocks. Karolyi (1996)

evaluated the stock market volatility around expiry days in Japan and found that intraday return volatility in the last hours of trading on expiration days and the first hours following expirations is marginally greater than that on non-expiration days. Bollen and Whaley (1999) also found no evidence of increased stock market volatility on futures and option expiration days in the Hong Kong market. In nutshell the response of various studies on the impact of derivative trading on spot market volatility is mixed.

**DATA AND METHODOLOGY**

The present study is conducted to evaluate the effect of introduction of derivative contracts on the volatility in the Indian Stock market. The data used for the study is the daily closing values of S&P CNX NIFTY Index for the period under study. The data source is NSE website. Firstly, the daily index returns are calculated using the formula  $\ln(p_t / p_{t-1})$ . Secondly, the 20 day, 50 day and 200 days rolling standard deviation in daily returns are computed from June 14, 1999 to June 3, 2002 that is, from year prior to the introduction of index future contracts to one year after the introduction of index option contracts. Thirdly, the variances in daily returns are computed for an event window of 20, 50, 100 and 200 days before and after the introduction of index futures. Assuming the normality of return distribution the F statistic is used to compare the variances.

**HYPOTHESIS OF THE STUDY**

H<sub>0</sub>: Variance in daily index returns is same in the pre and post introduction of nifty futures, that is,  $\sigma_1^2 = \sigma_2^2$

H<sub>1</sub>: Variance in daily index returns is not same in the pre and post introduction of nifty futures, that is,  $\sigma_1^2 \neq \sigma_2^2$

**RESULTS AND ANALYSIS**

On analysing it is observed that since the introduction of derivative contracts there has been a decline in the rolling standard deviation values in daily nifty returns (Figure 1).

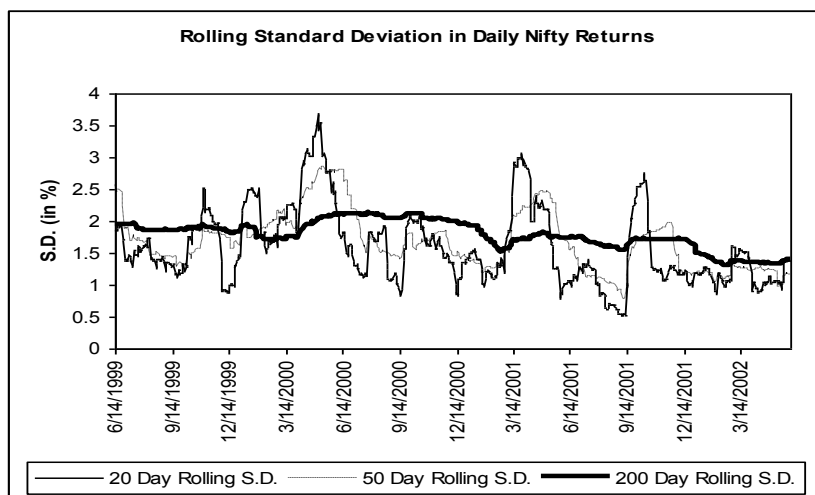


Figure 1: Rolling Standard Deviation in Daily Nifty Returns

The above figure shows that the 20 days rolling S.D. in daily nifty returns which stood at 1.856 per cent that is 29.35 per cent on annualised basis decreased to 1.41 per cent that is, 22.27 per cent on annualised basis. For computing the annualised volatility the daily volatility is multiplied with the square root of 250 which is the approximate number of trading days in a year. Similarly the 50 days rolling S.D. in daily nifty returns has fallen from 2.57 per cent to 1.18 per cent. On annualised basis the same has decreased from 40.62 per cent to 18.62 per cent. Finally the 200 days rolling S.D. in daily returns has come down from 2.0 per cent to 1.4 per cent. On annualised basis the same has decreased from 31.62 per cent to 22.14 per cent. In nutshell the figure depicts a decline in the unconditional volatility in the daily index returns following the introduction of index futures and option contracts.

While comparing the variances in the daily return data of nifty over a different period event windows it is observed that there existed a significant difference in the variances in the pre and post introduction of index futures and option contracts. Table 1 reveals that all the variances values are smaller in the post

**Table 1.** Variance in Daily Nifty Returns

Days	Variance Before	Variance After	F Value	F Value at 5%	F Value at 1%
20	0.000301	0.000157	1.918761	2.168	3.027
50	0.000784	0.000232	3.374266*	1.607	1.963
100	0.000564	0.000262	2.153494*	1.394	1.601
200	0.000445	0.00029	1.53134*	1.263	1.392

**Note:** \* Significant at 99 per cent.

derivative regime than in the pre derivative introduction period. Moreover barring 20 days the F values for all other variances are found statistically significant at 99 per cent level. Thus it is clearly evident that the unconditional volatility in the underlying spot market has decreased significantly after the introduction of index futures contracts in the Indian stock market.

## CONCLUSION

Comparing the rolling standard deviation and the variances in the daily return data over different period event windows in the pre and post periods of introduction of derivative contracts it is evident that there has been significant decline in the unconditional volatility in the daily returns data of underlying asset. However these results should not be used for the blanket endorsement of the view that derivative trading reduces volatility in the underlying spot market. Rather one needs further examination by analysing other factors that might have affected the said volatility during the period under study. One can also use the advanced econometric tools to evaluate the effect of derivative contracts on the conditional volatility. Moreover one also needs to examine the impact of different derivative aspects like trading volume and open interest in different derivative contracts on the volatility in underlying assets price. Last but not the least one can also look at any possible relationship between FIIs outstanding positions and the volatility in the spot market.

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